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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,586	03-28-2001	Juan Carlos Rocha-Alvarez	AMAT.5269.PDD.LOW K-JW	2854

32588 7590 02-05-2003

APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER

MEEKS, TIMOTHY HOWARD

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 02/05/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/820,586

Applicant(s)

ROCHA-ALVAREZ ET AL.

Examiner

Timothy H. Meeks

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 16-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-15 is/are rejected.
- 7) ☒ Claim(s) 4 and 5 is/are objected to.
- 8) ☒ Claim(s) 1-22 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 18 December 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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**DETAILED ACTION*****Election/Restrictions***

Applicant's election with traverse of claims 1-15 in Paper No. 5 is acknowledged. The traversal is on the ground(s) that the product of claim 16 could not be made by a different process because claim 16 requires the product be made by the process of claim 1. This is not found persuasive because patentability must be determined for the product of claim 16, the process of making not imparting patentability unless it causes a difference in the product that could not be produced by other methods. At this point, the same product would reasonably be able to be produced by other methods, therefore the search for the product is not the same as that for the method and determination of the patentability of the product would involve other issues than determining the patentability of the method. As such, there is an undue burden to examine both inventions.

The requirement is still deemed proper and is therefore made FINAL.

Claims 16-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention.

***Drawings***

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on December 18, 2002 have been approved by the examiner. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

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### *Claim Objections*

Claims 8 and 10 are objected to because of the following informalities: In claim 8, "tetraetheyl" is misspelled. In claim 10, the symbols prior to "C" should be "°". Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

Claims 6, 7, and 9-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 6, the antecedent basis for "the carrier gases" is unclear as only a single carrier gas was previously defined.

### *Claim Rejections - 35 USC § 103*

The following rejections are based upon the interpretation of the term "carbon silicon gas source" as a silicon and carbon containing compound. This term requires a compound that includes both silicon and carbon. The term "self-oxidizing carbon silicon source gas" is a gaseous carbon silicon compound that also includes oxygen.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 8, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rose et al. (6,068,884) in view of van de Ven et al. (5,882,417).

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Rose et al. disclose a process for depositing a film on a substrate comprising delivering a carbon silicon source to a gas chamber (11) through an inlet (28, 24) along with carrier gas and/or oxidizing gases via inlet (27), generating a plasma, and depositing a film from the gases onto a substrate on a wafer support (16) (col. 7, lines 1-30). TEOS and several siloxane compounds are disclosed as precursors at col. 5, lines 49-60. These are "self-oxidizing carbon silicon source gases".

Rose et al. do not disclose flowing a process gas mixture adjacent an edge of the substrate through a purge gas inlet in the substrate support.

Van de Ven discloses at col. 2:

The problem of edge and backside deposition is exacerbated by recent trends in the semiconductor industry toward more full utilization of the wafer surface area. The industry demands that material deposition conform to stated specifications over a major portion of the surface area of the wafer. Factors specified include uniformity and quality. Typically a portion of the frontside periphery of the wafer is excused from compliance with the specification because of wafer handling requirements. For example, for a 200 mm wafer, which is known in the industry as an "eight inch" wafer, the outside 6 mm of radius typically has been excused from compliance with the deposition standard, which results in an effective usable wafer diameter of 188 mm. However, recent supply problems in the industry due to capacity limitations have resulted in some manufacturers seeking greater utilization of the wafer surface area. For example, interest has been expressed in having an effective usable wafer diameter of at least 194 mm. Accordingly, methods and apparatus for chemical vapor deposition that permit an effective usable wafer diameter of nearly the full wafer diameter while preventing unwanted edge and backside deposition are desirable.

They solve this problem by delivering a deposition control gas comprising either inert gases or a mixture of inert gases and reactive component gases to the edge of the substrate to

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control deposition uniformity at the edge of the substrate. Specifically, van de Ven discloses at col. 9:

A variety of materials may be deposited using various process gases with suitably selected deposition control gases. For example, to deposit a tungsten film with the apparatus of FIGS. 1, 2, and 3, the product reactant  $WF_6$  is used under the reactant conditions of  $H_2$  and Ar. The  $WF_6$  and  $H_2$  gases are the reactant components of the process. A suitable deposition control gas is argon, hydrogen, or a mixture of argon and hydrogen. The various constituent gases are delivered to and mixed in a suitable manifold, as is well known in the art.

Silane, or  $SiH_4$ , is also used at the process station 4a. Initially, a mixture of  $SiH_4$ ,  $H_2$  and Ar is used to deposit a thin protective amorphous silicon film, which also provides a nucleation function under certain circumstances. Then, a mixture of  $WF_6$ ,  $SiH_4$ ,  $H_2$  and Ar is used to deposit an initial tungsten film. The  $WF_6$  consumes the thin amorphous silicon film.

Uniformity of deposition near the frontside periphery of the wafers being processed is further improved by including a reactive component of the process gas in the deposition control gas. In the example of the preceding paragraph in which the reactant gases are  $WF_6$  (product reactant) and  $H_2$  and the carrier gas is Ar or  $N_2$  or a mixture of Ar and  $N_2$ , improved uniformity of edge deposition is obtained by mixing the reactive component  $H_2$  with Ar or  $N_2$  or a mixture of Ar and  $N_2$  to obtain the deposition control gas. The proper proportion of reactive component to inert gas is determined empirically. The process gas mixture (e.g.  $WF_6 + H_2 + Ar$  flow ratios and  $WF_6 + H_2 + Ar$  total flow) and deposition control gas mixture (e.g.  $H_2 + Ar$  flow ratios and  $H_2 + Ar$  total flow) are interactively combined and changed to produce the best frontside wafer uniformity while maintaining process gas exclusion from the wafer edge and backside.

In depositing other films, other process gases with different reactant components may be used. Suitable inert gases for use in the deposition control gas mixture include argon, nitrogen, and helium or any suitable combination thereof.

and at col. 11:

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To improve the extent of uniform material deposition on the wafer 402 frontside periphery, the deposition control gas preferably includes one or more reactive components of the process gas as discussed above. The reactive component in the deposition control gas enhances deposition at the wafer 402 periphery to compensate for any process gas flow interference in a region caused by the deposition control gas venting from restrictive opening 706 and the physical presence of a portion of the extension 704 extending over the wafer 402 into the flow pattern of the process gas. For

Although deposition of tungsten is exemplified, it is clearly taught above that other films can be deposited using other reactant components used in the deposition control gas.

Therefore, flowing a process gas mixture adjacent an edge of the substrate through a purge gas inlet in the substrate support would have been obvious to control uniformity of the deposition at the edge of the wafer and prevent backside deposition of the film of Rose. Use of a combination of either of the reactants (silicon precursor or oxidizing gas) and inert gas used in the deposition of the films of Rose would have been obvious to achieve these advantages. With respect to claim 3, clearly the flow rate of the deposition control gas is determined based on an amount needed to prevent process gas from flowing to the backside of the wafer and to provide the uniform deposition at the substrate's edge, therefore, determining the claimed flow rates through routine experimentation for optimization would have been obvious.

#### *Allowable Subject Matter*

Claims 6, 7, and 9-13 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

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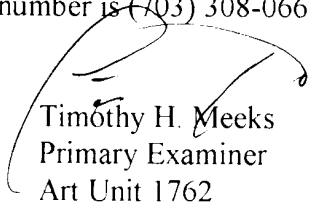
Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach or reasonably suggest that the process gas mixture delivered to the edge of the substrate from the substrate support comprises both the organosilicon and oxidizing gas reactants. The art teaches only to deliver one of the reactants to the edge of the substrate from the substrate support.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy H. Meeks whose telephone number is (703) 308-3816. The examiner can normally be reached on Mon, Tue, and Thu, 6:00-6:30, and Sun, 6-10 am.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Timothy H. Meeks  
Primary Examiner  
Art Unit 1762

nf  
February 4, 2003